THE Johns Hopkins MAGAZINE

March 1951

"The bonds we bought for our country's defense are helping our boy become a doctor!"

HOW U. S. SAVINGS BONDS ARE PAYING OFF FOR JOHN AND HELEN DALY OF STOCKTON, CALIFORNIA

John and Helen Daly are proud of their son, James. "Jim always wanted to be a doctor," says Helen, "and now he's getting his chance to study medicine, thanks to our U. S. Savings Bonds and the wonderful Payroll Savings Plan!"

"Jimmy was only 13 when John and I decided to make U. S. Savings Bonds a part of our plan for his future. I signed up then for the Payroll Savings Plan in the Stockton Naval Supply Annex where I work."

"We've saved $3,550, now. John has his phonograph business so I'm able to put more than 25% of my salary into Payroll Savings. I buy a $100 bond each month which goes toward paying for Jim's education."

"Jim's at the University of Santa Clara now, taking pre-medical work. Bonds are paying his tuition, and we're still buying them toward that M.D. for him. The Savings Bond method is wonderful for parents!"

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2. Decide to save a regular amount systematically, week after week or month after month. Even small sums saved on a systematic basis become a large sum in an amazingly short time!

3. Start saving automatically by signing up *today* in the Payroll Savings Plan where you work or the Bond-A-Month Plan where you bank. You may save as little as $1.25 a week or as much as $375 a month. If you can set aside just $7.50 weekly, in 10 years you'll have bonds and interest worth $4,329.02 cash!

You'll be providing security not only for yourself and your family but for the blessed free way of life that's so important to us all. And in far less time than you think, you'll discover that you have turned your dreams into reality, just as the Daly family did.

FOR YOUR SECURITY, AND YOUR COUNTRY'S TOO,
SAVE NOW—THROUGH REGULAR PURCHASE OF U. S. SAVINGS BONDS!

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THE Johns Hopkins MAGAZINE

VOLUME II March, 1951 NUMBER 6

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The Cover

The development of trained leaders through the Reserve Officers' Training Corps in America's colleges and universities has taken on added significance with the deepening of the world crisis. Beginning on Page 6, the Magazine shows, in pictures, how the ROTC is training men at Johns Hopkins.

Photo by Robert M. Mottar

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Many university men in America are training to meet a vital need: the military defense of the country. Here, in pictures, is the story of reserve-officer training at Johns Hopkins.

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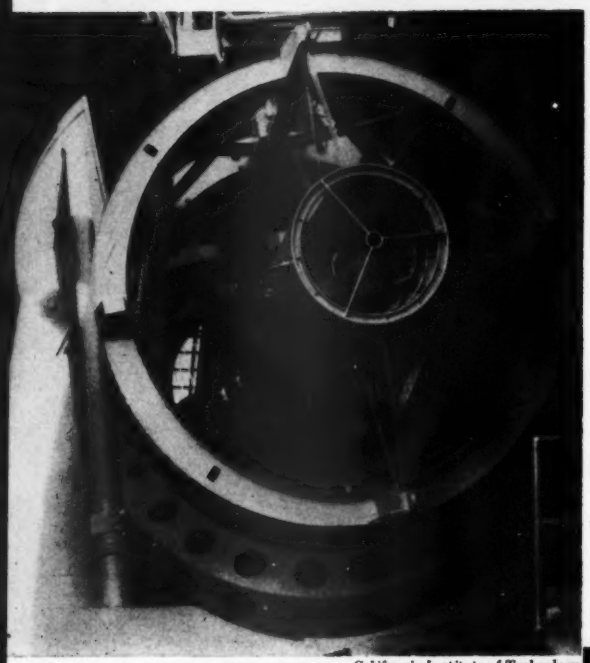
HOW WERE THE C



California Institute of Technology

Carnegie Institution of Washington

THE GREAT 200-inch telescope at Mt. Palomar (above) has so extended human vision that astronomers can now observe galaxies at the tremendous distance of one billion light years (one light *second* is equal to 186,000 miles). Note the comparative size of the astronomer seated within the central tube. The relatively close galaxy, Andromeda Nebula (right), has 300 million stars in its dense central region; it is very similar to our own Milky Way.

CHEMICAL ELEMENTS FORMED?

Two Hopkins men suggest what happened in the early moments of the expanding universe.

By RALPH A. ALPHER and ROBERT C. HERMAN

> Ay, for 'twere absurd
> To think that nature in the earth bred gold
> Perfect i' the instant: something went before.
> There must be remote matter.
> *The Alchemist, 1610*
> *Ben Jonson*

AMONG the fundamental questions which have always stimulated man's imagination and scientific endeavor is the problem of the structure, chemical composition, and evolution of the universe. Ancient peoples conceived of the universe as being conceptually small and designed for their comfort and convenience. The earth, and frequently the very homeland of the ancient philosophers, was thought to be the center of the cosmos.

The large telescopes of today, on the other hand, reveal a universe whose characteristics all but transcend the educated imaginations of modern scientists. To a good approximation we now know the universe to be mostly empty space, with occasional collections of stars which are called galaxies.

These galaxies are all much like our own Milky Way—a collection of some tens of billions of stars, one of which is the Sun. The Sun does not occupy a preferred position in the Milky Way, but is, in fact, a rather ordinary member of the immense local family of stars.

The scale of that part of the universe which astronomers have been able to study is indeed staggering. The 200-inch telescope of Mt. Palomar detects galaxies, with no apparent diminution in number, out to distances of a billion light years (about 6,000 billion billion miles). The light by which these distant galaxies are seen originated some billion years in the past.

Individual galaxies may range as high as 100,000 light years in diameter, and are separated from one another by distances of the order of a million light years. If the material in the universe were distributed uniformly, instead of being collected in galaxies, stars, and interstellar material, there would be about one atom per cubic meter—space is far emptier than the best vacuum one can produce in the laboratory.

The light by which we see galaxies reveals the fact that the universe is expanding. The void between galaxies is rapidly increasing and, in fact, galaxies are receding from one another at speeds proportional to their separation.

This recession is what one would expect if, at some distant time in the past, galaxies, or the primordial substances out of which they condensed, were rather closely packed, and some all-encompassing explosion occurred. In this explosion, the faster fragments would be found at greater distances from the source. In the more familiar terrestrial explosions, a snapshot of the fragments would show that their distances were actually proportional to their speed. So it is with galaxies.

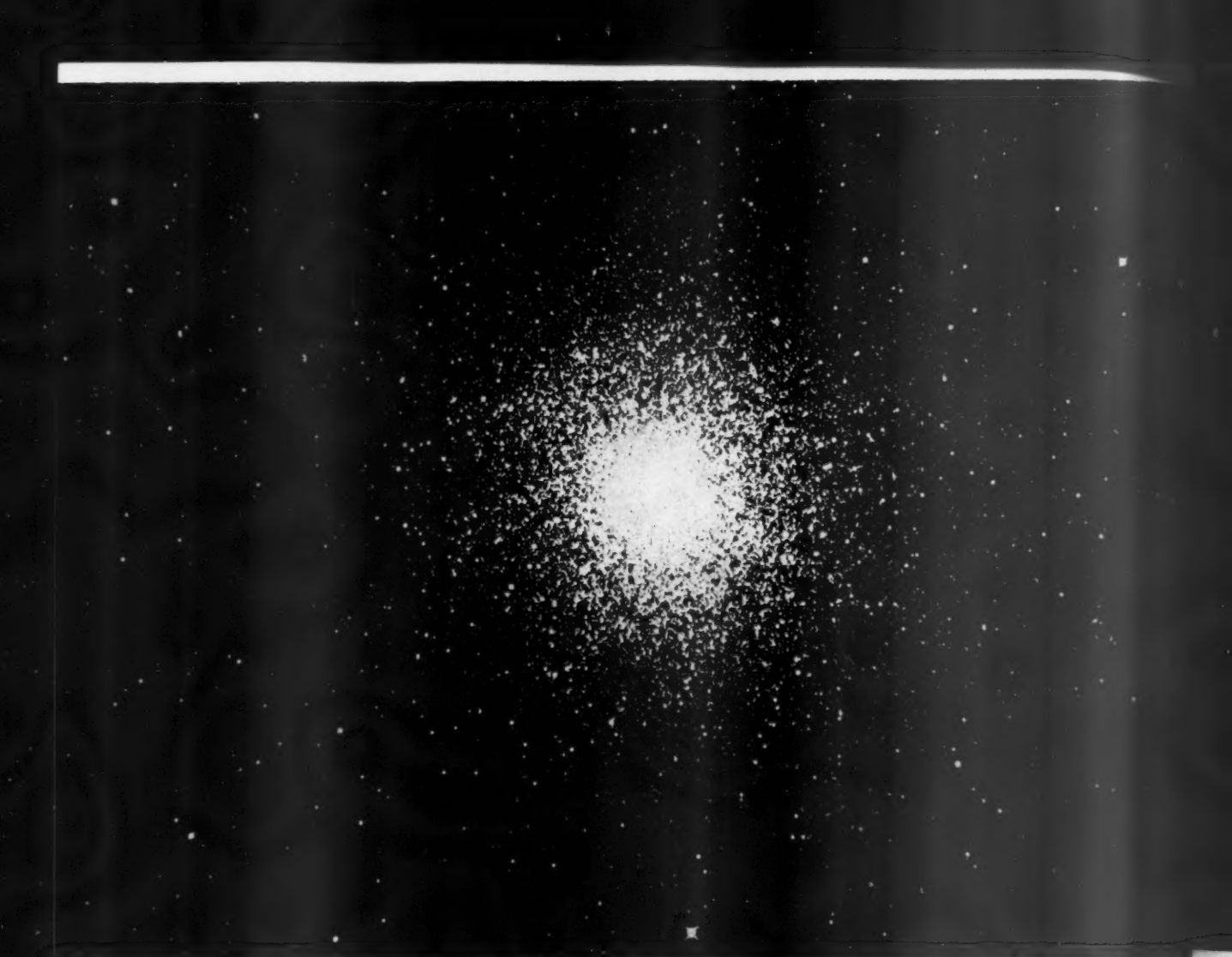
The measured speeds of recession place the time of this explosion or "great event" some two to three billion years in the past. Much has happened since then. The chemical elements were somehow synthesized, galaxies have developed, and stars and planetary systems have formed. All of these evolutionary problems fall within the province of cosmology—the study of the structure and evolution of the universe. In this article we shall be primarily concerned with the origin of the chemical elements.

OUR present knowledge of the structure and properties of the nuclei of the various chemical elements, together with astrophysical data on the relative abundance of the nuclear species in the universe, indicates that this abundance distribution may hold the key to the explanation of the origin of the elements making up the material universe.

One of the most outstanding features of the relative abundance data is the fact that, with few and understandable exceptions, the relative proportions of hydrogen, helium, carbon, nitrogen, oxygen, lead, uranium, and the other some 90-odd atomic species are the same regardless of location in the observable universe. Chemical analysis of the earth's crust and atmosphere, and of meteorites, together with spectroscopic analysis of planetary atmospheres, of the sun, of the stars and interstellar material in our galaxy, and of the remote galaxies, confirms the universal nature of the relative abundance distribution of the elements.

The question naturally arises as to

DRS. ALPHER and HERMAN are members of the staff of the Johns Hopkins Applied Physics Laboratory.



(Carnegie Institution of Washington

THIS GLOBULAR CLUSTER of stars, known as Messier 13, is situated about 30,000 light years away in our own galaxy (our small solar system is near the galaxy's outer edge). It contains 50,000 stars closely packed in a volume only 100 light years in diameter.

what may underlie the facts that the composition of the universe is so homogeneous and that hydrogen and helium are predominantly abundant, while the heaviest elements, such as lead and uranium, are present in only one part per hundred billion compared with hydrogen.

Over the past twenty years a number of theories based on modern views of nuclear structure have been suggested to explain the origin and relative abundance distribution of the elements. In one of these theories, called the "equilibrium" theory, synthesis of elements is supposed to have taken place inside certain types of stars—stars which eventually exploded and distributed these elements throughout space. Some investigators identify these stars as the explosive supernovae observed by astronomers. It is assumed that other kinds of stars, which are supposed to contain only hydrogen to begin with, sweep up by accretion the synthesized elements released by the supernovae.

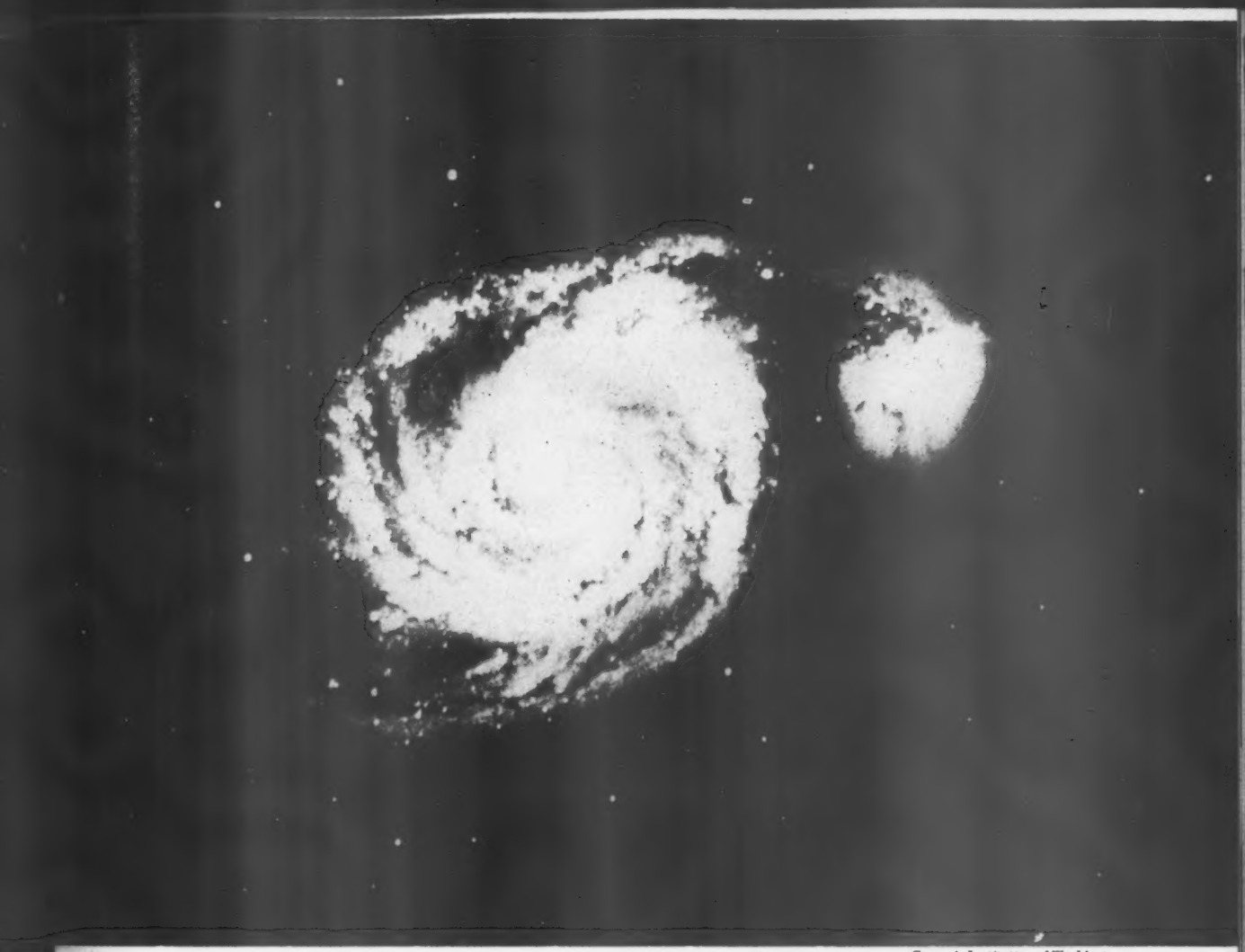
Other investigators suggest that the element-forming stars are "prestellar stars." Galaxies, stars, and planets are presumed to have formed from the exploded and homogeneously distributed material.

Another theory postulates a "primeval atom," containing all the material in the universe. Explosion or fission of this "atom" would have constituted the "great event," while the explosion fragments evolved into the chemical elements we know today. A variation of this latter idea deals with many primeval atoms, of merely stellar dimensions.

Recently a "matter creation" theory has been propounded, wherein matter somehow enters our universe from "elsewhere," at a rate sufficient that despite the observed expansion of the universe, the mean smeared-out density of matter is constant.

FINALLY, a non-equilibrium theory developed principally by the authors with Dr. George Gamow, of the George Washington University, suggests that the elements are the result of a non-equilibrium process in the early stages of the expanding universe. This process involves the building up of elements from neutrons and protons as primordial constituents or "ylem," by a series of successive neutron captures with intervening radioactive disintegrations.

There are various pieces of evidence indicating that the present relative abundance distribution of elements may have been established at an early stage of the expanding universe. Well-established methods of extrapolating from



Carnegie Institution of Washington

THE WHIRLPOOL NEBULA consists of two galaxies separated by about 3,500 light years. Appearing in the constellation Canis Venatica, it is now 2.5 million light years distant from us and is moving away from our galaxy at a speed of about 310 miles per second.

presently observed amounts of such naturally radioactive elements as uranium and thorium suggest that these elements were formed some two to three billion years ago. This time coincides very well with the age of the universe as determined by the evolution of stars, clusters of stars, and galaxies, as well as the rate of expansion of the universe.

This, together with the remarkable homogeneity of composition of the observable part of the universe, strongly suggests that the elements were already formed in their present relative amounts prior to the formation of the celestial bodies now visible to us. One seeks, therefore, physical processes which would have synthesized the elements in the primitive medium preceding the formation of celestial bodies.

The non-equilibrium theory which has been developed stems from a most reasonable correlation observed between the relative abundances of various elements and the relative ability, as measured in the laboratory, of these elements to capture neutrons, one of the elementary constituents of nuclei. With a knowledge of these relative capture or "sticking" probabilities, together with a theoretical reconstruction of the physical properties of the early stages of the expanding universe based on Einstein's general theory of relativity, it has been possible to formulate the following picture.

Some several hundred seconds after the "great event" marking the start of the universal expansion, the universe was uniformly filled with a very hot gas, consisting of neutrons, protons, positive and negative electrons, neutrinos, and radiation, principally in the form of gamma-rays. The rapidly decreasing temperature was then of the order of a billion degrees, about a hundred times greater than the temperature in the center of an A-bomb explosion. The density of matter was perhaps a thousandth the density of the earth's atmosphere at present.

As this gas expanded and cooled below the "boiling point" of nuclei (the temperature at which collisions and interaction with the high energy radiation present would dissociate nuclei faster than they could form), nuclear reactions leading to the building of nuclei proceeded.

Neutrons and protons collided and stuck together to form deuterons—the nuclei of heavy hydrogen. These nuclei in turn picked up neutrons to yield tritium nuclei—a still heavier isotope of the hydrogen nucleus. A variety of nuclear reactions among the very light elements, combined with the predominantly important successive neutron

Continued on Page 24

ROTC

Through it, the Army trains men to be leaders in critical times.

Photographs by Robert M. Mottar

ONE of America's great sources of strength in critical times like these is its reserve of military leadership. To provide an important part of that reserve, the United States Army for more than three decades has authorized selected universities to maintain units of the Reserve Officers' Training Corps.

Thirty-five years ago, one of the first ROTC battalions in the country was established at Johns Hopkins. Today, with the increased demand for military leaders, approximately 425 Hopkins undergraduates, plus another fifty-four at the School of Medicine, are taking courses with the ROTC. They will, if they complete their courses successfully, be commissioned in the Infantry, Corps of Engineers, or Medical Corps reserves. On these pages, in pictures, are some of their activities.

EVERY ROTC STUDENT is issued an M-1 rifle, which he is responsible for keeping in good condition. The training program includes familiarizing students with many weapons used in present-day Army, including pistols, heavy and light machine guns, recoilless rifles, and mortars.

ROTC training includes an hour of drill each week.

THE ARMY ISSUES free uniforms to the students in ROTC training. The student above is trading in worn-out shoes for a new pair at the Hopkins supply room. Uniforms are required at weekly drills.

ROTC training is thorough

UNDERGRADUATES enrolled in the Hopkins ROTC are organized into two units: infantry and engineers. Their training program is divided into two two-year parts: a basic course and an advanced.

During basic training, the ROTC cadet receives instruction in fundamental military subjects, and he is trained in the use of weapons and marksmanship. He spends two hours a week in classes, one in military drill.

The pace is stepped up for juniors and seniors in the advanced ROTC course. They put in five classroom hours each week and one of drill. Their subjects become more specialized; increased emphasis is placed upon leadership, drill, and exercise of command. And they spend six weeks in summer camp, applying the theories they have learned.

Advanced-course cadets receive pay, in the form of "commutation in lieu of subsistence," at the rate of ninety cents a day. During their stay at summer camp, they receive the pay of an Army private, plus allowances for travel to and from the camp.

A WELL-EQUIPPED RIFLE RANGE in basement of Hopkins ROTC building is used for training. Men above are learning prone-position shooting under eyes of coaches. Wheels control targets.

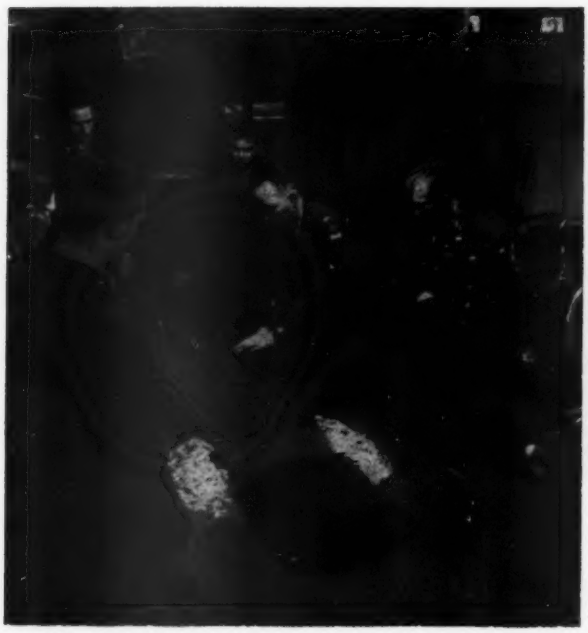
ACCURACY of shooting is watched through telescopes.

PREPARING TO SHOOT ON ROTC RANGE, a rifle-team member dons shooting jacket and adjusts the sling of his rifle. The range is fitted with eight shooting positions; target zone is protected by wall of heavy steel. The Hopkins ROTC building, a relatively new addition to the Homewood campus, houses, in addition to the range, a large lecture hall, several classrooms, supply room, and offices.

Outdoor-range firing takes place at ROTC summer camp.

AFTER THEY HAVE FIRED, students check their targets. On ROTC's indoor range, only .22 calibre rifles are used.

TACTICAL BATTLE PROBLEMS are considered by advanced infantry students. On this table, sand is arranged to simulate a particular type of terrain, complete to details of model buildings, trees, and road.



FRESHMEN LEARN MAP-READING from an enlarged army-type map. They study cartographic symbols and landmarks.

ENGINEERS prepare to tear down and rebuild exact scale model of floating bridge. Note pontoons.

NEWEST WEAPONS and their uses are taught by the ROTC. Above, students examine a 75 mm. recoilless rifle. They learn not only how to operate the rifle but also its tactical advantages, where and how it is used to greatest effect.

Future lieutenants

MOST ROTC graduates are commissioned as second lieutenants in the Army Organized Reserve Corps. Graduates in the Medical Unit receive commissions as first lieutenants in the Medical Corps Reserve. Outstanding cadets are designated as "distinguished military students" and may compete for appointment in the Regular Army.

On these two pages are some of the diversified subjects in which ROTC students, both basic and advanced, are trained.

SENIORS in both engineering and infantry are taught geographical foundations of national power.

U. S. Army Signal Corps

SUMMER TRAINING PROGRAM takes ROTC students to camp, between junior and senior years. Hopkins infantry students above and at right are shown at camp last summer.

Active duty faces most ROTC men

The international situation looms large in every ROTC student's mind these days. Although his induction into service is usually deferred as long as his academic and military service is satisfactory, he faces the possibility of a quick call-up when he finishes school. As a condition of draft deferment, ROTC students agree to serve on active duty for two years after graduation, if called upon to do so.

INTERNATIONAL TENSENESS has had its effect on students' interest in military training. The men above are freshman who, having just heard a Hopkins ROTC officer explain the training opportunities at the University, are filling out medical forms, preparatory to taking physicals. Below, students study a situation map of the Korean war which is kept up-to-date by ROTC staff.

Robert M. Mottar

MEDICINE AND SOCIAL SCIENCE

How valid is the growing conviction that the medical world, in its training programs and in its practices, must increase its emphasis upon social realities?

By RICHARD HARRISON SHRYOCK

FIFTY years ago medicine was classified as a natural science, and medical practice as the art of applying natural science to the prevention or cure of human ills. Although this view is still generally accepted, it is now qualified by enthusiasm for the possibilities of "social medicine" and even by references to medicine as a social science or art. How valid is this growing conviction, however expressed, that there are social as well as biological realities which must be taken into account by the medical world?

There is nothing new in the thought that medicine has social significance and that social conditions have some bearing on medicine. All sciences and related arts, indeed, have social implications, and are, in turn, themselves influenced by conditions within society. Physics had a hand in producing the modern steam engine, for example; and then the widespread use of this engine later reacted upon science by directing attention into the problems of thermodynamics. In like manner medical science lengthened the average life-span, only to have this react upon medicine by making more urgent the disease problems peculiar to an aging population. It will be noted, however, that such interrelations have usually been unplanned, indirect, and even unexpected. Physicists who worked on the early steam engine did not anticipate an industrial revolution; nor did bacteriologists who conquered infectious diseases expect thereby to intensify the problems presented by chronic diseases.

In addition to these indirect relations, to these implications common to all sciences, medicine has had more immediate contacts with the society in which it operates. For medicine, unlike most of the natural sciences, deals primarily with human beings, and for this reason is bound to have some things in common with other disciplines which are concerned with human behavior. Much as sociologists advise on public procedures in dealing with the social menace of crime, so physicians advise on measures for coping with the social menace of epidemics; and just because sociologists and physicians deal directly with their fellow men, they have encountered various social reactions which are rarely imposed upon physical scientists. The latter have usually done as they pleased with test tubes and pendulums. Not so the sociologists, whose inquiries into race relations may arouse local antagonisms, nor the physicians whose methods have often met with popular disapproval.

ANATOMICAL studies were inhibited for centuries by popular opposition to dissections, and this was associated with all the scandals of grave-robbing. Not until an enterprising "sack-'em-up man" in Edinburgh murdered some twenty persons in order to sell their bodies, did the British and American governments make some legal provision for dissections. These circumstances operated as serious obstacles to medical research and provided one explanation of the lag in this field in comparison with earlier progress in physical science. This was realized as early as the thirteenth century by Roger Bacon, when he observed that "the operative and practical sciences which do their work on insensate bodies can multiply their experiments till they get rid of deficiency and errors, but a physician cannot do this because of the nobility of the material in which he works. . . . Wherefore physicians are to be excused for their defects more than other workers in the sciences."

IN certain respects medicine has suffered more from public pressures than have the social sciences and this for the good reason that medicine relates to the most intimate, the most vital concerns of all men—to health and disease, to birth and death. To cite the opposition to human dissection—which persists today in an abhorrence of autopsies—is to note but one obvious illustration. It is hardly necessary to remind anyone in Baltimore, for example, that when medical men employed animal experimentation they were opposed by an aggressive anti-vivisection movement. More subtle have been social factors which, over the past, have delayed progress by encouraging hasty work and useless speculation in medicine. Most natural scientists and even many social investigators could suspend judgment and proceed with due caution; but physicians were under

DR. SHRYOCK is William H. Welch Professor of the History of Medicine and director of the Institute of the History of Medicine at Johns Hopkins.

constant pressure to get quick results. After all, men were dying and doctors themselves were only human: wishful thinking could support almost any theory and practice under these circumstances.

Social impacts upon medicine have not been limited to research, but are felt in certain instances in practice as well. This is especially the case in practice involving the critical events of birth and death, since these raise the most serious moral problems. It may be held that society as a whole, rather than physicians alone, should determine answers to such issues as "birth control" or "mercy killings." Yet nice questions are raised if a physician decides that the health of his patient requires a procedure which is condemned by some on moral or religious grounds.

If the doctor in such a case were a medical missionary and his problem involved the religious outlook of a culture other than our own—some primitive taboo, perhaps—we would doubtless say that he should ignore this and think only of his patient's welfare. Or, better yet, we could urge him to study this primitive culture so as to adjust his practice to it effectively. This would involve him in social investigations. If he is to work intelligently he must become an amateur anthropologist, unless, by good fortune, there is a professional social scientist at hand to advise him.

A SITUATION of this sort poses an important question. How far can medicine and the social sciences, each dealing with human behavior, be of mutual service? For what is so obviously true of the physician working within an exotic culture is also valid, in a more subtle way, when he deals with persons within his own society. Throughout the centuries, doctors have been more or less conscious of this: in order to serve patients best, something must be known of them as persons.

This awareness was expressed, in its most superficial form, in a desire to utilize the doctor-patient relationship for the latter's benefit. The patient must be "humored," encouraged, or disciplined, as occasion demanded; and this in turn might call for an effective "bedside manner." All this implied that a good relationship was an important element in therapeutic procedures—a point insisted upon today by all spokesmen for organized medicine. Cynics will add that the doctor-patient relationship may also be exploited to the former's advantage, if he is unfortunately motivated by sordid considerations. The patient may be encouraged to accept useless or even dangerous services. Quacks have always been keen observers of human nature.

The observant physician often realized that effective relationships might involve more than a mere *rapport* with the patient. He must probe deeper into the latter's personality and background if he was to fully understand the illness. What of the patient's mental state? It was a common observation that emotional factors—tension and anxiety, hope and fear—influenced health in an obscure but potent manner. And these states could be related in turn to the patient's personal environment: to his family, his occupation, even to his social status. It is a truism that the "old family doctor," who was in a position to see the larger setting, gave some heed to these matters. "Mr. Smith," he might observe, "would not be sick if he could lift the mortgage on his farm." Or "Mrs. Jones' case needs what no one can give her—the return of her lost child."

THE attention accorded to social-psychological elements in illness has varied greatly with time and place, even within western civilization. In the eighteenth century, for example, leading physicians rather took the significance of these elements for granted. Thus Benjamin Rush of Philadelphia listed emotional tensions growing out of social situations as a common cause of sickness. He declared, for example, that in an age (culture) much given to theology, even the memorization of too many sermons might occasion serious illness.

During the nineteenth century, however, research in pathologic anatomy focused medical attention upon a localized, structural pathology and upon the specific diseases associated therewith. Insofar as doctors concentrated on localized lesions they tended to see cases rather than personalities, and so lost sight of the social background as well. This trend was of course a gradual one; and general practitioners never entirely lost their concern for what might be called the human factors. Professional leaders whose training in pathology antedated 1860 still took a lively interest in the doctor-patient relationship. Thus Dr. Oliver Wendell Holmes, advising colleagues on "The Morning Visit,"

Continued on Page 25

Robert M. Mottar

RESEARCH HAS ITS TROUBLES IN JAPAN

A Hopkins student who has viewed Japanese science first-hand, during the war and after it, describes some of its tribulations.

By MASAO YOSHIDA

I FINISHED school in the midst of the war, in 1943, and entered the Japanese Navy as a technical officer. I happened to be posted to a naval research station in Tokyo. Here I had the fortune of getting a glimpse of what was certainly the most all-inclusive and best-equipped technical research institute in Japan, and I would like to speak more about my experiences in that laboratory later on.

As soon as the war was over I returned to my old university, since somehow I always had the notion that a college professor was the ideal job for me. My attempt at becoming a scholar ended in complete failure. After vainly struggling for three years, I decided to try my fortune somewhere else, and finally found a job with the Occupation Forces as an interpreter and liaison man between the section of the occupation headquarters concerned with science and technology and various Japanese government and industrial scientific organs and establishments.

This work brought me into contact with the Japanese scientific organizations, and gave me some insight into the workings of the Japanese research system and the individual scientist. I held the somewhat flattering title of "Technical Advisor to the General Headquarters of the Supreme Commander for the Allied Powers," until I left Japan last July. I might just mention that there must be several hundred Japanese subjects holding the same title; it's just another way of calling an interpreter.

To return to my experience in the naval laboratory, my department was the Materials Testing Section, consisting of an impressive array of testing machines arranged in a great big hall. The manner in which the first research theme was assigned to me seems so very characteristic of the particular scientist who was in charge of the department and who, in turn, might symbolize an average Japanese scholar of rather mediocre calibre.

He gave me a list of very imposing research subjects, such as "Correlation of Fatigue with Changes in Electric Resistance of Steel," "Application of Ultrasonic Techniques to Metal Alloying," etc., etc. It was an array of subjects that could involve even a brilliant scientist in years of intensive research. He mentioned that he had at various times investigated all of these problems and would be glad to have me try a hand at any of them, where he had left off.

IN Japan the learned scholar is held in such high esteem that he is often very much tempted to think himself a much greater man than he actually is, and he launches into research problems far beyond his capacity. He may solve them by serenely throwing in illogical assumptions and juggling with figures. Nobody will challenge him, either because they don't care to disgrace the scholastic dignity of a respectable scientist, or because they simply apply the oriental philosophy of leaving alone things that do not directly affect one.

If, by some chance, someone does dare to challenge the validity of a scientific paper, the professor from whom the author is receiving guidance will come to his rescue and defend him as if he were saving his own life, not reflecting at all whether the challenger did or did not have reason for his attack. This sort of championing of one's proteges is the effect of a scholastic form of feudalism, and it makes a political issue of purely scientific matters.

Two of the most vital contributions that could be made to scientific research

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MR. YOSHIDA is a graduate student in the Johns Hopkins School of Engineering. His father is Premier of Japan.

in Japan would be to discover some means of putting a stop to politics in science; and of producing an atmosphere in academic circles which would make it too uncomfortable for the mediocre scholar to keep on in his muddling with roundabout reasonings and cryptical mathematical expressions that nobody cares to follow. I do not mean to include in this statement the really brilliant scientist, who should be encouraged in whatever field in which he may choose to specialize.

TO go back to 1943, when I was confronted with an array of research subjects in the naval institute, I chose a theme which seemed to be the least impossible, namely "Fatigue Properties of Steel at High Temperatures." Even with a complete set of apparatus which I found remaining from previous experiments, it took me months to straighten out such details as getting a uniform temperature distribution through the test piece.

By the time the experiment got on its way, the war had come to quite a grim stage for us: shipping was being crippled, our own submarines seldom came home undamaged if they managed to make port at all. I was no exception in feeling left out of the war effort by being tied down to a testing machine. So, apart from filing requests to be transferred elsewhere, I raised a howl at my boss about getting us some subject that would help our country more than finding out how a .5 per cent carbon steel behaved at three hundred degrees Centigrade.

The result was that he came in one day with a research project on calcium hydride. When this chemical comes into contact with water, it releases a quantity of hydrogen. Properly processed and packed, it might be shot from submarines to baffle radar-type detection instruments.

In this affair I failed completely, for I knew nothing about the chemistry or metallurgy of calcium. The best thing I could have done might have been to do nothing, and to merely act as a clearing house for reports from other laboratories and companies. But I had to show people that we were doing something ourselves down at the naval institute, and so we carried on our muddling and meddling without getting anything out of it.

I do not know whether it is a peculiarly Japanese trait or not, but we often fall into the illusion that the expenditure of time and money and effort, the making of sacrifices, or even the simple endurance of hardships has in itself some intrinsic objective value. And we forget to reflect on whether anything is really being gotten out of all our troubles. As for our experiments, by the time we were able to present the navy with a workable model detection baffler, there were not many submarines left to take advantage of our efforts.

THE war over, I returned to the university and placed myself under the guidance of a professor in thermodynamics. For myself, there followed three unfruitful years devoted to a monotonous series of experiments which, incidentally, had very little to do with thermodynamics. Of great value, however, was my chance to observe the contrasting atmospheres within the university.

The School of Engineering consisted of four departments, with half a dozen semi-independent institutes. Among these institutes, only two seemed to be turning out valuable work, and at the head of both were men with remarkable qualities, both as scholars and administrators. They proved to me that the fate of an institute, whether it will go down in history as a great institution or will barely manage to exist and vegetate, depends largely upon the man at the head of it.

The Metals Institute was directed by the famed Dr. Honda. Though he must have been more than eighty years old and was supposed to have retired ages ago, people still looked to him for help whenever something went wrong. His fame, apart from his achievements in the field of magnetic steel, lay in his ability to raise a group of brilliant scholars to follow him. Stories were told of how he would visit each room of his institute every day, would look over the shoulder of whoever he might find in the room, riddle him with sharp questions, give him just the sort of advice he was looking for, and leave the room. To the student, he was "a great man." Next day he might be in Tokyo, haggling with the Minister of Finance, and ultimately returning with a fat check for the construction of a new wing for his institute.

Prof. Nukiyama, himself near seventy, directed the other important institute, the Electrical Communication Laboratory, and was also head of the school's electrical engineering department. Here one sensed an atmosphere of great good fellowship and teamwork among the professors and the various research groups.

The mechanical engineering department in which I found myself was a totally different matter. Here nobody existed who provided tangible leadership to bind the department together. Every professor was the king of his own castle; he felt no urge to contact the outside world, or even his fellow professor in his neighboring cell. He might remain enshrouded in his ivory tower all of his life, toying with some seemingly profound fundamental theory which was in fact very remote from the problems confronting the production lines.

The whole department met for seminars, but these were perfunctory functions and nobody, sometimes not excepting the speaker himself, would know what the talk was about. There was no way to objectively check the value of a professor's work or the capacity of researchers farther down the line. Occasionally a professor might happen to be frank enough to tell his assistant that he was not doing his job and had better go elsewhere. This, of course, occurred very rarely. However it was, in effect, what happened to me, and I owe to it my experience with the Occupation Forces.

BUT before going into that, let me summarize my opinions about Japanese science and scientists:

First, in Japan, as might be expected anywhere, there are more mediocre scientists than really bright ones. Many by political machinations, some by bluffing, and others by mere luck are carrying on their haphazard work and sapping the meagre supply of research funds available. This money could with much advantage be transferred to help out the really good scientists.

Second, Japanese scientists have a

Continued on Page 27

NEWS at Johns Hopkins

A digest of developments at the University and Hospital in recent weeks

As in nearly every phase of national life, the quickening tempo of the American defense effort was having its deep effects upon Johns Hopkins in recent weeks. Substantial numbers of students had already left school to join the armed services. (Until the rules were changed in January, it had been necessary for prospective draftees to enlist voluntarily, before receiving notices from their draft boards, if they were to be assigned to the service of their choice. Therefore many students signed up with the Navy and Air Force even before completing the first term of the University year, and the story was the same in colleges and universities across the country.) Others were in the draft-age bracket or nearing it; they could expect notices of induction soon after the end of the current school year—and this brought Johns Hopkins, along with many other institutions which have large male enrolments, face to face with the problem of diminishing numbers of students.

What does the future hold? The papers were full of proposals and counter-proposals, and at this writing there was no clear answer to the question. There was talk of a new G. I. Bill of Rights, which would include educational benefits for ex-servicemen; but few results of that, even if it develops, could be expected to be felt by the universities in the immediate future. There were intimations that the armed services might assign some of their members to training in colleges and universities; but this, too, appeared to be far from a definite stage. Meanwhile, applications from high-school seniors, which had been expected by University admissions authorities to drop in the face of the draft situation this year, were running close to normal levels; even though they faced eventual induction into the services, high-school students seemed determined to get at least a start on their college careers before donning a uniform.

At the Hospital, twenty-four members of the House Staff had been called into the armed services by the first week in February, along with three nurses and thirty other employees. Personnel shortages already were bringing adjustments on all levels of Hospital service. And as an indispensable part of the defense structure, the Hospital had appointed a committee on "emergency procedures" to make preparations; the committee, meeting weekly, has studied and revised World War II disaster plans and set up three emergency areas for receiving casualties into the Hospital; each department, through the committee, has drafted emergency plans: supply needs, placement of additional beds, temporary reallocations of operating rooms, nurseries, other essential facilities. Thirty-two Red Cross nurses' aides began receiving ward training. And special meetings were being called to discuss the creation of a new Hopkins Hospital Army Unit, with Dr. J. Herman Long, gynecologist, being named chairman of the committee to activate the unit.

J. DOUGLAS COLMAN has been named to the new position of Vice-President for Financial Development of the Johns Hopkins University and Hospital. (See story at right.)

New Vice-President

J. Douglas Colman has been named to the newly-created position of Vice-President for Financial Development of the Johns Hopkins University and the Johns Hopkins Hospital. In this post he will integrate the development programs of the two institutions.

Mr. Colman has been a lecturer on public health administration at the School of Hygiene and Public Health, and also director of the Maryland Hospital Service (Blue Cross) and the Maryland Medical Service (Blue Shield).

Blakeslee-Lane

THE BARN stands on Homewood campus just across the Bowl from Homewood House. Originally a stable on the old Carroll estate, the remodeled Barn now serves as a theater for the Playshop, the student Barnstormers, and the Children's Experimental Theater.

His new appointment became effective February 15.

In commenting on the new appointment Dr. Bronk said, "The Trustees, faculty, and staffs of the University and Hospital are united in the next phase of the development of these pioneering institutions.

"The Hopkins institutions have been in the forefront of scientific and scholarly achievement during their first seventy-five fruitful years. It is our purpose now to assure their continued productivity during the closing years of their first century.

"The appointment of Mr. Colman is an indication of our resolve to implement new plans, although further elaboration of them is necessary before presentation for public consideration."

Commemoration Day

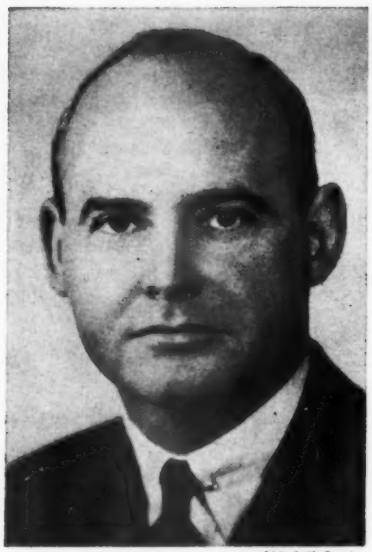
On February 22, the University marked, with exercises and the presenting of honorary degrees, its seventy-fifth anniversary. This issue of *The Johns Hopkins Magazine* went to press several weeks in advance of that date; therefore the details of the Commemoration Day ceremonies and of the meetings of alumni organizations which were scheduled to take place during Commemoration Week will be reported in the April issue.

Where They Go

Each year the graduate departments of the University send out a new group of students. What happens to them after they have completed their required courses at Hopkins? Some idea of their diverse occupations may be gained by looking at a single department.

Last year seven students completed their residence requirements for a Ph.D. degree in the department of Political Economy. None of them actually obtained a degree in June, because their doctoral dissertations were still in progress. Some finished their dissertations in October, others will spend as much as two more years working on them. Yet all of these students secured fellowship awards, teaching or research positions.

Three are instructors in economics, at Princeton, Washington University, and the University of Illinois. One is senior economist in the Wages and Hours Division of the U. S. Department



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NEW UNIVERSITY TRUSTEES: JACOB FRANCE, CHRISTIAN HERTER, THOMAS S. NICHOLS (SEE STORY BELOW.)

of Labor. Another has been appointed research associate with a Hopkins research project, "Growth of the Business Firm."

Two of the students have received fellowships. One has a post-doctoral fellowship at the University of Chicago. The other was awarded a social science research fellowship to cover both income and travel expenses for field work on labor economics in the United States.

Two others who have not advanced so far in their studies are respectively research assistant at the University of Michigan and economics instructor at Trinity College, Washington.

This unusually high performance is possible, the Hopkins men believe, because the department is limited to a total of twenty-five of the most promising applicants. Dr. Heberton Evans, professor of political economy, believes that the high quality of students can be maintained only when it is possible for them to acquire at the same time research experience and means of financial support.

TV Award

The Johns Hopkins Science Review was one of ten television programs named to the Honor Roll of 1950, a prize list compiled by the *New York Times*. The *Times* called the show "a heartening example of what can be done in educational TV when there is a will."

A weekly show broadcast Tuesday evenings over the Du Mont network, the Science Review presents Hopkins experts who discuss the theories and achievements of modern science. The show has been highly praised both for its skillful production techniques and for its success in presenting advanced scientific ideas in a form comprehensible to the layman.

Lynn Poole, director of public relations for the University, inaugurated the Science Review four years ago. With the assistance of Sterling Reynolds, he now plans and directs the programs and acts as moderator for the shows.

New Trustees

Three new members—Jacob France, Representative Christian A. Herter, and Thomas S. Nichols—have been elected to the University's Board of Trustees.

Mr. France has been a member of the Maryland bar for forty-eight years. He is chairman of the board of the Equitable Trust Company and of the Mid-Continent Petroleum Corporation; a director in the Great Lakes Pipe Line Company, the Commercial National Bank and Trust Company (New York), the Savings Bank of Baltimore, the Maryland Title Guarantee Company, and the American Petroleum Institute; and a member of the advisory council for the United States Department of Commerce and the American Petroleum Institute.

Representative Herter has been a member of the House of Representatives from Massachusetts for eight years. An authority on international affairs, he was instrumental in the founding of the School of Advanced International Studies, now a part of the University. Mr. Herter's career has included service in diplomatic posts, as personal assistant to Herbert Hoover when the latter was Secretary of Commerce, and as editor and associate editor, respectively, of *The Independent* and *The Sportsman*.

Mr. Nichols is president and chairman of the board of the Mathieson Chemical Corporation and president and a director of the newly formed Mathieson Hydrocarbon Chemical Corporation. He served in World War II as special assistant to Dr. Ernest W. Reid, director of the chemicals bureau (later a part of the War Production Board). In 1943 he served with the Harriman mission to London and then became chairman of the Sulphuric Acid Operating Committee. In 1945 he returned to Europe as chemical member of the Technical - Industrial Disarmament Committee.

Adams Diploma

The Heidelburg diploma of Dr. Herbert B. Adams, first professor of history at Johns Hopkins, has been presented to the University by Mrs. Miner H. A. Evans.

Dr. Adams joined the history department in 1876 as one of the first twenty fellows to be appointed to the Hopkins staff. He advanced rapidly to associate and associate professor, and in 1891 was named to the new post of Professor of American International History.

He has been called by Dr. John French the man who "did more to advance scholarship in the subject

which he professed than any other man of his generation. He was an inspiring promoter of achievement in both men and organizations . . . and sent out from his seminary table a group of scholars who dominated the teaching of history in American colleges for years after his untimely death in 1901."

Recent Books

JAMES FRANCK, fac. '34–'38 (and W. E. Loomis): *Photosynthesis in Plants.*

ARTHUR GROLLMAN, B.A. '20, Ph.D. '23 (Chem.), M.D. '30, fac. '23–'41: *Essentials of Endocrinology.*

O. HOBART MOWRER, Ph.D. '32 (Psych.): *Learning Theory and Personality Dynamics: Selected Papers.*

THOMAS PARK, fel. '33–'35, fac. '35–'37 (and W. C. Allee, A. E. Emerson, O. Park, K. P. Schmidt): *Ecology.*

Faculty Notes

President Detlev W. Bronk has been elected president of the American Association for the Advancement of Science, to take office January 1, 1952. At the annual meeting of the AAAS, he delivered the Phi Beta Kappa address, "Science and the National Welfare." He also participated in a panel discussion on "Effects of Government Support on Scientific Research."

Dr. Bronk has been elected chairman of the Executive Committee of the National Science Foundation.

At the Applied Physics Laboratory, J. A. Van Allen has resigned to become professor and head of the physics department at the State University of Iowa. Dr. Van Allen, J. J. Hopfield, and H. E. Clearman, all of the APL staff, have been awarded third prize in a science photography contest sponsored by *The Scientific Monthly* and the Smithsonian Institution. Their entry was a photograph of the solar spectrum made from a V-2 rocket.

Walter A. Good has been awarded the Kalamazoo College Citation by the college alumni association "in recognition of outstanding achievements and services which reflect honor upon Kalamazoo College."

The following scientists have joined the APL staff recently:

Chih Kung Jen, formerly of the Tsing Hua University in Peiping;

Edwin Shotland, formerly senior project analytical engineer for the Chance Vought Aircraft Co. in Dallas;

Robin D. Compton, former motion picture-television technical director for the National Broadcasting Company;

Leo C. Miller, formerly in radio and television maintenance business in New York;

Gabriel C. Buonagurio, former plant engineer for the Sandia Corporation.

At the School of Engineering, Abel Wolman, professor of sanitary engineering, has been named to a four-member board which will help plan for the dispersal of thousands of Federal employees as a defense against atomic bombing of Washington.

In the Faculty of Philosophy, N. Bryllion Fagin, associate professor of English and drama, recently participated in the annual conventions of the Modern Language Association and the American Educational Theater Association in New York.

The Bangkok *Post* recently cited Dr. Robert L. Pendleton, Professor of Tropical Soils and Agriculture in the Isaiah Bowman School of Geography, for his contributions to Thailand's agricultural improvement program. Dr. Pendleton has been on leave of absence since last year.

Four Hopkins linguists presented papers before the Modern Language Association meeting: Arno C. Schirokauer, professor of German; Pedro Salinas, professor of Romance languages; Leo Spitzer, professor of Romance philology; and H. Carrington Lancaster, professor of French literature.

David Aberle, formerly of Harvard University, is now visiting associate professor of social anthropology in the Page School of International Relations.

George Boas, professor of philosophy, has been elected president of the American Philosophical Association.

Fritz Machlup, professor of political economy, has flown to Switzerland to present a course in international trade at the Institute of Advanced Studies in Geneva.

At the Hospital, George W. Dana has been named director of the Medical Care Clinic.

Harry L. Chant has been appointed assistant director in charge of professional services and director of the Out-Patient Department. Dr. Chant had been director of the Medical Care Clinic.

Lad Grapski has been named assistant director in charge of nonprofessional services, responsible for the business aspects of the Hospital.

At the School of Medicine, Richard H. Shryock, professor of the history of medicine, has been named by President Truman to the National Historical Publications Commission. The commission was recently expanded to carry out the President's suggestion to gather and publish the private papers of outstanding American citizens.

John C. Whitehorn, professor of psychiatry, was the chief speaker at the

Jack Engeman

LAD GRAPSKI has been appointed assistant director of the Johns Hopkins Hospital. Dr. Grapski will be responsible for nonprofessional services.

Jack Engeman

HARRY L. CHANT has been named assistant director of the Hospital in charge of professional services, and also director of the Out-Patient Department.

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annual meeting of the Peripatetic Club, held this year at the Hospital. He addressed the doctors on "The Significance of Psychiatry for General Medical Advancement."

George G. Finney, assistant professor of surgery, has been elected a member of the board of trustees of Princeton University.

At the School of Hygiene and Public Health, Paul A. Lembcke has been appointed associate professor of public health administration.

Alumni Notes

Austin R. Middleton, B.A. '10, Ph.D. '15, F. by C. '15–'16, has been chosen president-elect of the Conference of State Academies of Science, a division of the American Association for the Advancement of Science.

Hugh L. Dryden, B.A. '18, M.A. '19, Ph.D. '19, has been given the 1950 Daniel Guggenheim Award for "outstanding leadership in aeronautical research and fundamental contributions to aeronautical science."

John R. Bartels, B.A. '20, has been appointed a Supreme Court Justice for the Second Judicial District (Kings County) in the State of New York.

Morgan M. Buchner, B.A. '26, was recently made Master in Chancery by the Supreme Bench of Baltimore City.

Howard C. Knapp, M.D. '28, is the new Base Surgeon and director of medical service for Edwards Air Force Base, Muroc, Calif.

Sylvan Lebow, B.A. '32, has been appointed executive director of the National Federation of Temple Brotherhoods.

W. Winchester White, Jr., '34–'36, was recently honored for exceptional sales achievements by the Mutual Benefit Life Insurance Company.

Karl T. Compton, LL.D. (hon.) '37, was awarded the William Procter Prize for scientific achievement by the Scientific Research Society of America.

Frank A. Calderone, M.P.H. '37, last month became director of the Health Service of the United Nations.

Alumni Meetings

At the January dinner of the Johns Hopkins Club of New England, held in the Harvard Faculty Club, Dr. George W. Thorn was elected president of the club for the present year. Dr. Bruce H. Billings was elected secretary-treasurer, and four members were elected to the executive committee:

Affiliated Photo—Conray

JOHN R. BARTELS, president of the New York Alumni Association, has been made a supreme court justice in New York state.

Dr. Edward L. Moreland, Dr. Helen S. Pittman, Dr. Warren R. Sisson, and Dr. Taylor Starck.

The Washington Alumni Association attended the first lecture of a McCoy College series, "Recent Developments in Science," on February 12. Dr. Detlev W. Bronk opened the series, speaking on "Science and the Modern World." After the lecture the association held a business meeting at which new officers were elected.

At an evening meeting on February 16 in Cincinnati, the Ohio Valley Association planned a special program to show two movies: one from the Medical School on the treatment and diagnosis of a "blue baby" and an operation performed by Dr. Alfred Blalock; the second from the Applied Physics Laboratory showing recent development and operation of the guided missile program.

Dr. Alan M. Chesney was scheduled to speak to the Alumni Association of Georgia at a dinner meeting February 17 in Atlanta. A sound movie of "The Early Days of the Medical School" with Dr. Welch as narrator was to be shown.

The Johns Hopkins Club of New York was scheduled to meet February 20 at the New York Athletic Club.

Alumni in Chicago planned to meet February 20 at the WGN studios to watch the television broadcast celebrating the University's 75th anniversary. After the show members attended a buffet supper at the Sheraton Hotel.

Deaths

(Dates are 1951, unless otherwise noted.)

William DeWitt Andrus, M.D. '21 fac. '21–'22, January 20.

Goesta A. Bagge, g. '04–'05 (Econ.), January 3.

Bennet Bernard Browne, Jr., B.A. '98, M.D. '02, January 25.

William H. Buschke, fac. '38–'43, December 21, 1950.

Harry T. Chism, '02–'03 (Arts), December 16, 1950.

Arthur H. Clarke, g. '01–'03 (Sem.), September 28, 1950.

Howard Garland Clements, Jr., '50 (Arts), December 6, 1950.

John Collinson, M.D. '11, Dr. P.H. '23, December 14, 1950.

Walter H. Coolidge, Ph.D. '15 (Chem.), December 18, 1950.

Elisabeth Gilman, B.S. '21, December 14, 1950.

George J. Heuer, M.D. '07, fac. '12–'22, December 15, 1950.

Floyd Katske, B.A. '37, M.D. '41, January 14.

Harry M. Kaufman, B.A. '97, M.D. '01, January 1.

Rudolph August Kleinschmidt, '96–'97 (Arts), September 3, 1947.

Philip R. Miller, M.D. '28, December 23, 1950.

Herbert H. Murphy, M.A. '15 (Educ.), January 5.

William P. Neilson, Jr., '29–'33 (Arts), December 2, 1950.

Randolph Norwood, B.A. '24, January 6.

Walter W. Palmer, fac. '19–'21, October 28, 1950.

Arthur J. Patek, B.A. '89, October 12, 1950.

David Philipson, g. '83–'87 (Sem.), June 29, 1949.

William Gwynn Queen, g. '04–'05 (Biol.), January 3.

Esther Rosencrantz, M.D. '04, December 18, 1950.

Harold L. Russell, B.A. '09, December 28, 1950.

Selma Solomon Sachs, '35–'39, '48–'49 (McCoy Col.), December 31, 1949.

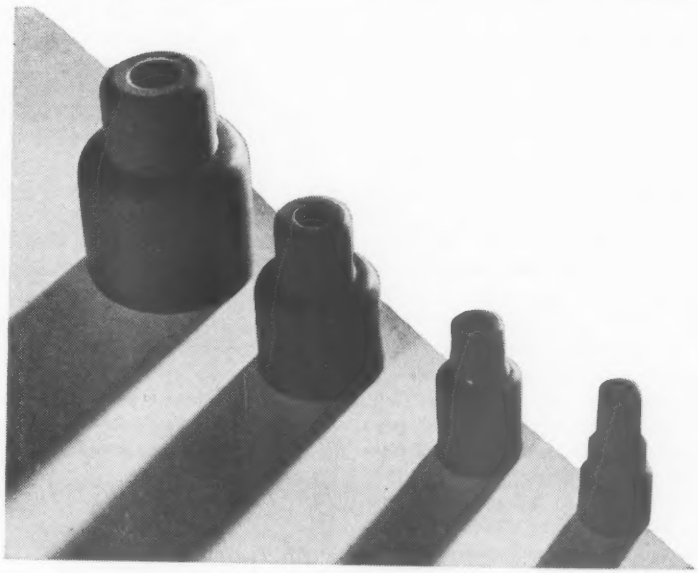
John Cleveland Salter, M.D. '01, December 21, 1950.

Vernon P. Scheidt, Ph.D. '33 (Psych.), January 18.

Edith H. Swift, M.D. '05, April 29, 1950.

Robert James Wigton, '19–'22 (Engr.), February 7, 1950.

T. Dudley Williams, B.A. '97, g. '97–'98 (Biol.), M.D. '02, December 2, 1950.



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ORIGIN OF THE ELEMENTS

Continued from Page 5

captures, led to the presence of heavier and heavier nuclei.

Now there is an upper limit to the ratio of neutrons to protons which an atomic nucleus can have and still be stable, i.e., not be spontaneously radioactive. When this limit was exceeded by nuclei capturing successive neutrons, they underwent beta-decay.

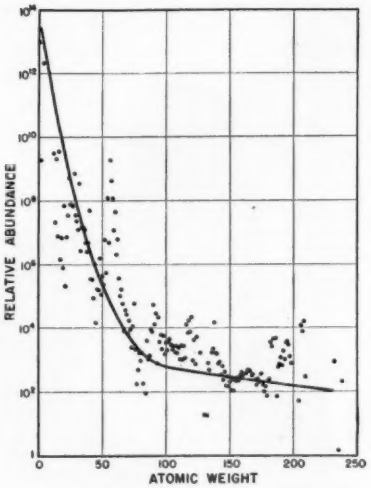
In beta-decay one or more of the neutrons already in the nucleus are changed over to a proton, and an equal number of electrons is emitted by the nucleus. This more stable end nucleus is then no longer neutron-saturated, and could capture more neutrons until another beta-decay became necessary. Thus one had successive neutron captures with intervening beta-decay to adjust the neutron-proton ratio.

The increasingly heavier nuclei in the expanding universe were formed in increasingly smaller amounts because the heavier a nucleus becomes the more easily an incoming neutron can stick. In a manner of speaking, the more easily a nucleus would capture a neutron, the more quickly it would transmute into the species next highest in atomic weight.

In the course of the expansion of the universe particles became more separated, and collisions and neutron capture reactions became less frequent. Furthermore, the neutrons originally present were being used up in making nuclei by these capture reactions as well as changing from free neutrons into protons by their beta-decay.

Universal expansion, neutron capture, and neutron decay rather quickly brought to an end the element-synthesizing reactions, and the gas finally evolved into one whose relative composition was that found universally today.

Numerical calculations of this formation process made by the authors show that one should indeed expect the present observed abundance distribution to have been established, at least insofar as major features are concerned, by a time of the order of half an hour to an hour after the start of the element forming process. The agreement between the theory in its present form, which ignores many of the detailed properties of nuclei, and the observed abundance



This graph shows the variation of the universal relative abundances of the elements. The vertical scale is given in powers of 10, and the horizontal scale in atomic weight units (i.e., relative to hydrogen at atomic weight 1). Some of the more familiar elements such as helium, carbon, nitrogen, oxygen iron, lead, and uranium, may be observed on the graph at atomic weights 4, 12, 14, 16, 56, 207, and 238, respectively.

distribution may be seen in the accompanying illustration (see diagram above).

It should not be inferred that the question of how elements were synthesized is completely settled. Many of the detailed fluctuations in relative abundance apparent in the accompanying figure have yet to be explained quantitatively. The barriers to such an explanation include mathematical difficulties as well as the lack of detailed knowledge concerning many of the nuclear reactions which should be included in a more complete theoretical picture. Yet it must be emphasized that our current knowledge certainly allows at least a qualitative explanation of the "troublesome" details.

PERHAPS the most interesting feature of the theory of element formation outlined above is that it fits into the broad outlines of the more comprehensive study of the structure and evolution of the universe.

The neutron-capture theory predicts a homogeneous medium of such composition, temperature, and density that galaxies might have originally formed as some kind of condensation. These condensations would have had to become gravitationally stable, and locally to have overcome the expansion of the medium. The universe, however, would have continued to expand, and mutual recession of galaxies resulted.

Within these condensations of the primordial matter—embryonic galaxies—moderately well understood processes would have led to further small-scale condensations—the forerunners of stars now making up galaxies. Some of these stars, we do not know how many, would have acquired a system of planets, of which our solar system is perhaps representative. The hypothesis of successive stages of evolution resulting from condensation out of a primordial material appears attractive in view of the homogeneous composition of the observable universe.

WITH the ever-increasing penetration into space made by modern telescopes, astronomers are delving further into the past. What new things are to be revealed only time will tell. Out of a recorded history of some 3,000 years a mere hundred years have seen the vast extension of man's horizons in space and in time back three billion years.

However, it is difficult to know how far one can safely extrapolate the essentially meagre amount of empirical information concerning the universe which exists at the present time. One might prefer to limit theoretical speculation to the firm base of observational data or use the techniques of modern theoretical physics to effect a considerable extrapolation. These different points of view have been ably expressed by two of our foremost cosmologists. On the one hand, Tolman has stated the belief that "a knowledge of the *whole* universe is certainly given to no man, and its treatment as an understood *unit* is possible to no man—not even a philosopher. Whatever philosophers may do, and indeed I think should do, it seems imperative that those of us who are scientists should write only on subjects concerning which we have specific observational knowledge."

On the other hand, de Sitter has appealed for a somewhat less restricted approach in saying, "By the use of mathematics, that most nearly perfect and most immaterial tool of the human mind, we try to transcend as much as possible the limitations imposed by our finiteness and materiality, and to penetrate ever nearer to the understanding of the mysterious unity of the Cosmos."

MEDICINE AND SOCIAL SCIENCE

Continued from Page 15

protested against the tendency to ignore personality:

> So of your questions don't in mercy try
> To pump your patient absolutely dry;
> He's not a mollusk squirming in a dish,
> You're not Agassiz, and he's not a fish.

But the focus on localized, specific diseases was sharpened, nevertheless, by the achievements of bacteriology after 1880. Professional interest shifted further from the patient to the disease as such. This trend was encouraged by professional as well as by scientific developments—for example, by the growth of specialization. The specialist, by definition, was not primarily interested in the patient as a whole. At the same time, medical education was changing in such a way as to deprive students of opportunities for observing patients in their usual social setting. Apprenticeship to an older doctor had once taken students into homes, but this system was gradually abandoned as the time devoted to formal (medical school) education increased. After about 1875, when university hospitals began to be established, students saw more of patients in the wards; and this was justly viewed as a great advance in medical education. Nevertheless, the ward environment did not reveal patients in their usual settings; moreover, it set up psychological problems in patient-hospital relations which rarely received much attention from either students or clinicians.

In contrast to the way in which clinicians isolated the patient from his ordinary surroundings, public health men emphasized the relationships of men to their social environment. The half century between 1850 and 1900 was the heyday of sanitary reform, when it was believed that the health of great numbers was best protected by a control of their *physical* surroundings—of housing, water supply, and the like. One might have expected this to extend, by analogy, to men's personal or "cultural" environments; but usually this was only hinted at by implication. The outlook of most public health leaders was that of statisticians, engineers, and epidemiologists, rather than of psychologists or social scientists. Morever, even the sanitarians' concept of environment made little impression at first upon the majority of physicians, as was witnessed by the long lag in introducing public hygiene or preventive medicine into the medical curriculum.

One hastens to add that most of the trends here noted were highly desirable in themselves, since basic progress in both medicine and public health would have been impossible in this era along any other lines. But a price was paid, in that personality factors in illness were largely forgotten or relegated to a vague domain known as "just your nerves." Specialists and research men became rather proud of their exclusive preoccupation with the data and methods of natural science. They had come a long way by 1900, from Rush's view that disease could result from such intangible circumstances as an overdose of theology.

Professional outlooks, having reached this extreme, swung slowly back thereafter. This was partly the result of developments within the medical sciences, partly of trends within society at large. Within the medical sciences there appeared specialties, such as nutritional studies and endocrinology, which dealt with physiologic conditions involving the entire body or a considerable portion thereof. A partly non-localized pathology of fluids or "humors" came back into the picture. Even immunology, which had grown out of bacteriology and continued to relate to specific infections, could not be focused on localized processes. Medical science began to see the patient whole again.

Perhaps the most dramatic illustration of this was afforded by psychiatry, in which interest shifted from a search for somatic (brain) lesions to a psychological analysis. The former approach had dealt largely with the influence exerted by body upon mind; but psychology revived interest in the reverse influence of mind upon body. Psychiatrists were at first chiefly concerned with the individual personality as such, and with its bearing on mental disease. But their interests broadened logically to include the relation of personality to the surrounding environment, and also to take in the influence exerted by mental states upon so-called somatic or physical disorders. After about 1910 a literature on the two-way relationships of body and mind proliferated under the heading of the "psychosomatic"—a term which actually went back to the older orientation, having been used as early as 1820. But by 1910 this earlier outlook had been so far forgotten that psychosomatic studies were viewed as heralding a new dispensation.

In the degree to which these outlooks were adopted by medical men after World War I, the way was prepared for more adequate attention to the patient in terms of (1) his total physical condition, (2) the relation of this condition to his mental state or personality, and (3) the relation of personality to his social environment. The intelligent physician could, in some measure, take all these matters into consideration. But, at best, the clinician or general practitioner was not fully trained to deal with psychiatric problems; and was even more the amateur in regard to cultural factors.

It was fortunate, therefore, that psychiatry became an established specialty in the twentieth century, and also that the social sciences began to emerge on a level of critical objectivity similar to that earlier attained by the natural sciences. It is true that some anthropologists and sociologists, like many historians, overlooked the significance of health and disease. There were still good texts in anthropology, for instance, which as late as 1935 did not even list such terms as "health," "disease," and "medicine" in their indexes—as if these matters were of small concern to primitive peoples. But certain social scientists took up the relation of culture to disease in the area where this was most obvious; that is, in the case of mental illness. The resulting contacts between anthropologists or social psychologists, on the one hand, and psychiatrists on the other, began to bridge the gap between the

social and medical scientists. Medical historians, standing midway between physicians and general historians, served the same end by calling attention to the relationships of medical and social phenomena which had been so conspicuous in times past.

It is true that, up to now, cooperation between medical and social scientists has been more a matter of precept than of practice. There were, of course, certain ways in which physicians were of increasing service to social practitioners during the present century, as when doctors were brought into industry, into schools, and into the courts. Medical men entered social institutions earlier than social scientists appeared in medical centers, presumably because medical knowledge and prestige were well established by 1900, whereas the social sciences were still an unknown quantity at that time. For this very reason the most promising new departures now relate to services which social scientists, in turn, may render to their medical colleagues.

THERE are certain fields in which the need for such services has long been apparent. Most obvious is that of "medical care" in the sense of medical relief and health insurance. Here one has problems which are as much social as medical in character. Some of the chief difficulties in the British national health system, for example, are still—after forty years of cumulative experience—those of an economic nature. Yet social scientists, at least in this country, have given such difficulties far less attention than have the physicians. This is unfortunate; not only because the technical knowledge of economists and statisticians is called for, but also because social scientists are in a position to take a relatively detached view of current programs. The economist, to be sure, may have some personal bias; but at least his own professional interests are not directly involved. There is a distinct need for economic and sociologic studies in this controversial field. The medical historian, again, can also be of service by interpreting present issues in medical care in the light of origins and past experience.

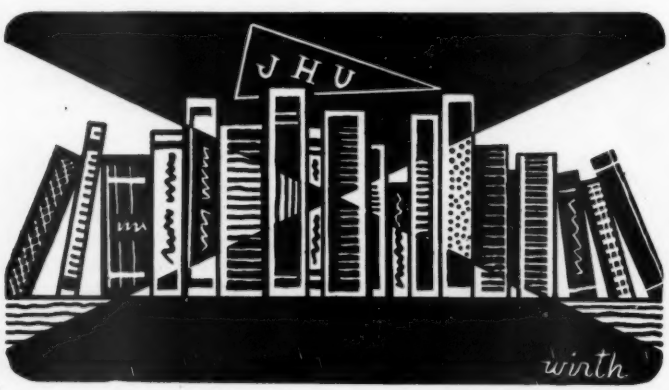
Health insurance is not the only area on which medical and social interests converge. Public health has become a far broader field than it was in the days of "sanitary reform," and schools of hygiene may find it helpful to consult —if not actually to employ—economists, sociologists, or specialists in public administration. In like manner, economic or social perspectives are now indicated in training programs relating to nursing, medical social work, and hospital management.

It has been mentioned that, in actual medical practice, psychiatrists were among the first to bring personality back into the picture. The psychoanalysts, for example, elaborated theories about the role of cultural factors—such as social taboos—in the origin of neuroses. But psychiatrists were not usually trained to deal with social phenomena as such, and their approach needed to be supplemented by that of social scientists who had specialized on relationships between culture and personality. In the Washington (D.C.) School of Psychiatry this need is now formally recognized in the curriculum, which includes such courses as "cultural anthropology," "problems of aging," and "social psychology."

Within general medical practice apart from psychiatry, contacts with social science may be those involved in psychosomatic relationships. The mere existence of these relationships, however, does not imply that social scientists can be helpful to the practitioner. It is one thing to suggest, for instance, that business worries have something to do with a patient's ulcers, and quite another to show what aid an economist can offer in this situation. Perhaps the wise doctor, sensing mounting tensions in his patient, would advise him in advance to consult business experts who would solve his difficulties before they involved illness. The experts in this case would, in a broad sense, be unconsciously practicing a sort of preventive medicine.

More direct and tangible services may be provided by social scientists in dealing with the personal relationships which obtain between various types of practitioners and their patients. Specialists in social or individual behavior may be able to observe such phenomena in a more objective and systematic manner than can the busy medical practitioner. This is especially true of patient relationships within the hospital, since the latter institution provides an atmosphere which influences behavior and also lends itself to systematic, well-controlled studies. The possibilities here are suggested by a series of investigations now being made in cooperation between the Russell Sage Foundation and the New York Hospital-Cornell Medical Center in New York City. Here a professional anthropologist, with the full cooperation of the medical staff, is guiding studies of such significant matters as "The Physician-Patient Relationship," "The Nurse-Patient Relationship," and "Interpersonal Relationships Within a Therapeutic Setting."

MORE experimentation of this sort is in order. What the outcomes will be cannot be predicted with any certainty. It may appear that social science can best serve medical education and practice indirectly through special conferences, or by other arrangements which bring social concepts and perspectives into the general consciousness of the medical profession. Or it may be that the further experiment of introducing formal requirements in social science—in medical economics, medical history, and interpersonal relationships—will seem desirable in certain medical schools. It is believed in some quarters that a general overhauling of medical education is again due, much as it was some forty years ago in this country. If this is undertaken, the responsible authorities will doubtless give serious consideration to the place of social science in the medical programs of the future.



RESEARCH IN JAPAN

Continued from Page 17

predilection for the basic and fundamental sciences. There is a cult prevailing which makes them regard these categories of science as something on a much higher level than the more useful industrial research. The latter they consider petty and mercenary. As a result, industry is lagging far behind the possible developments that could be realized if all the knowledge available right now in Japan could be harnessed to production methods and other useful work.

Third, the Japanese scientist still retains a lingering savor of the medieval alchemist who hid all his knowledge behind a veil of secrecy and mystery. This leads to isolation, lack of stimulation and communication, duplication of work, waste.

What can be done about it? I would welcome suggestions, but before trying to discover wonderful plans for revolutionizing Japanese science, let us find out if the scientists themselves are doing anything about remedying the trouble with science in Japan.

MY principal assignment in the Scientific and Technical Division of General MacArthur's headquarters was liaison with the Japan Science Council (JSC), which was the newly established representative scientific organization of a national scale. Its 210 members were elected for a three-year term in equal numbers from the seven fields of literature, law, economics, fundamental sciences, engineering, agriculture, and medicine. The president, two vice-presidents, and officers of the seven divisions were elected from these members. The divisions were mutually exclusive, but a member could be elected to two or more of the committees which were set up as necessary. The council had a secretariat maintained by the government and staffed with government officials.

Another organization with which it was my duty to keep contact was the Scientific and Technical Administration Commission (STAC). It had two purposes: to form a contact between the government and JSC; and to provide coordination on technical matters among various government agencies. STAC was a full-fledged government board composed of an equal number of members from JSC and the government. The government side was actually represented by vice-ministers of agencies with a more or less scientific coloring, such as the ministries of Education or Transportation.

This gave us a representative body of all the scientists of the nation, democratically elected from among the scientists themselves, and a delegation from this body with the express mission of advising the government on matters scientific and technical. This setup you might call as ideal as could ever be contrived.

BUT the actual story is not so good. The nation's scientists were fairly well disposed to back JSC because pains had been taken to make it clear that it was not an idea that was conceived in

Washington, D.C., and transported ready-made to Japan to be pushed down their throats. The trouble lay with the government. As far as it was concerned, JSC was something which the scientists chose to set up for themselves, and so had nothing to do with the government; while STAC was just a nuisance which these meddlesome scientists thrust on the government.

STAC had no binding power on the government, so when advices and recommendations began piling up on the Prime Minister's lap, you could not always blame him for politely saying thank you and promptly forgetting all about it.

However, the Prime Minister was only a figurehead. All the tactful guidance, the leadership that made all the difference to the building up of prestige of a new government body, lay in the hands of the Vice-President, who was to be one of the cabinet ministers. STAC was very unfortunate in this respect; it got the wrong man. In a recent cabinet reshuffle, this man was disposed of and something much better was substituted. Now at least we have a basis, a skeleton on which an influential advisory body to the government might be developed.

One subject that every scientist finds of vital interest is the question of money, and allocation of research funds comes foremost as a subject of discussion.

NOW that Japan's major industrial concerns have been disintegrated by the anti-trust law, what little research was going on under industrial sponsorship has dwindled to a minimun. As a result eighty per cent of all research expenses are financed out of public funds. In 1949 this amounted to an equivalent of $18.5 million, and every scientist finds himself obliged to fight for every yen he is going to slice out of this over-all framework. JSC provides the battleground for much of this budgetary war.

Some of this public money is spent quietly and effectively by scientists under different ministries, as in the Ministry of Agriculture's fine laboratory for silk research. But one category, called grants-in-aid, is doled out to any laboratory considered suitable. In the case of the Ministry of Education, it has taken the stand that it is the scientists themselves who should know best what subjects should receive allocations. So they have set up a committee of about five hundred scientists to meet in a big room and wrangle over who is going to get how much. What happens by asking a committee of five hundred to divide a limited sum of money equitably among themselves and the people they represent is very simple: after much heated discussion you arrive at a situation where each professor or laboratory worker manages to get enough money to buy two notebooks, and that is about all.

One of the first things JSC did was to set up a committee to consider allocation of funds. The committee came out with a strong recommendation about getting more money allotted to a few really good people and nominated the members for a new committee of five hundred. This reformed committee came out with a plan of distribution which provided for the professor this time to get not only his notebooks, but also some pencils. But anyway it was a step, or at least half a step, forward.

At present, JSC has a committee for gathering data on which to base pressure-group action to squeeze more money out of the government, and another committee to decide on how to

divide the spoils—in other words a policy-making group for the committee of five hundred.

THE project of another committee was to send out questionnaires asking what was considered the bottleneck to the effective utilization of research results. The consensus, in this survey was that there was not enough money to follow research through to a successful industrial stage. This complaint was heard in industrial laboratories, as well as in the institutions carrying on more fundamental phases of research.

There are two main reasons why the companies do not provide these funds. First, industrial application usually means the financing of an intermediate stage of experimentation called the pilot-plant phase. This costs quite a lump of money, and either the company cannot spare it or management does not trust the scientists enough to risk the investment. Second, the fundamental in the attitude of management is the die-hard idea that research is a luxury, a show for advertisement, and not an investment. As long as the white-robed scientists contentedly play about with the test tubes allotted to them, it's all peaceful and quiet. But once they start clamoring for pilot plants and things, it gets too much for management; and it puts its foot down.

To meet this situation, the JSC committee came forward with the plan for a sort of bank that loans money to finance pilot plants. A fund would be provided by the government and put under custody of a government board, which would screen applications for pilot-plant loans, and loan out appropriate sums of money to those whose plans look hopeful. If and when the plant begins to make money, the loanees would return the money to the revolving fund. The idea, with all its apparent weak points as well as its potentialities, has been successfully sold to the government through STAC—at least it has been sold to the extent that the government has set up a separate committee to consider the proposition.

The wide interests of JSC are indicated by a random sample of titles of topics that have come up during meetings:

Science abstracting services and compilation of a union catalog of scientific publications;

Laws governing universities;

Measures for meeting and preventing damage in natural calamities;

Reform of the patent system;

Study into technical solutions to the shortage of caking coal for steel industries.

It will be recognized that all these measures call for some action on the part of the government. Frequently it still happens that the recommendations from JSC, discussed and adopted by STAC, end by dying a natural death on the lap of the Prime Minister. But with the gradual rise in the prestige of STAC, and with the STAC members getting to know ways of pushing, coercing, enticing the government to do things, more and more is being accomplished.

LET us look again at the three shortcomings of Japanese science which I mentioned earlier, and see whether there are any signs that people are at least aware that something should be done.

First, regarding the concentration of funds to help the better scientists, the JSC committee on research budgets has stated its opinion on this point. It would concentrate on a few good research projects and let the others starve. But on the other hand, you find a strong protest against any discharge of scientists for any reason. The fact is that most of those who have been discharged were communists, or were supposed to be anyway, and brilliant workers happened to be mixed up among them.

Second, concerning the predilection for basic research, what I said about the white-robed scientists in the industrial laboratory might give some justification for the dislike of working for industry. It would seem that the scientists themselves are not always to be blamed. The JSC is having a bite at the problem of marrying research and industry, with the plan for a revolving fund.

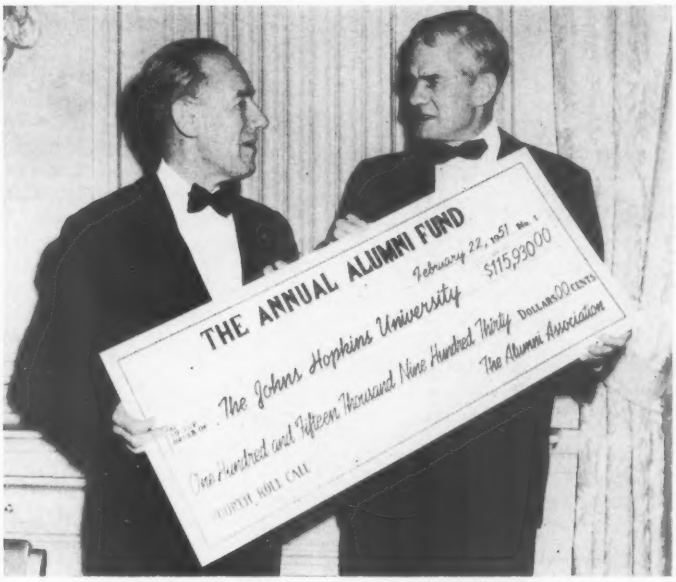
Third, on lack of communication, part of this is due to the difficulties in getting scientific papers published. Now, along with a desire for keeping a good thing to oneself there is a feeling in man that makes him want to brag about it. Providing a smooth and easy means of publishing would help a lot in breaking down the barriers.

Undoubtedly the greatest problem at present is that the government is not taking JSC and STAC very seriously. The two groups are making quite an issue of this. But for one thing, you can't expect people to beat a path to your door by simply putting out a sign saying that you have advice for everyone and a cure for every ill. So far JSC and STAC have not had too much chance to prove their worth to the government.

For another, to the oriental mind there is a feeling, though it may be almost unconscious, that to ask a question is to show one's ignorance. And for such a dignified establishment as the government or its illustrious servants to be reduced to the plight of having to seek advice from the people, the common scientists, must be something unbearably humiliating.

A third reason is that the universal feeling of sectionalism hampers the free and frank seeking of advice. A man may know perfectly well that his affairs are in a mess, but to save his life he is not going to let others know about it, far less ask others what he should do about it. That is what blocks the full utilization of the second function of STAC, which is to coordinate the scientific and technical activities of the various government agencies. Who wants to ask the advice of a bunch of scientists, mere amateurs compared to himself who has been working on the particular problems for years? And far more, who would like to think that he was going to be dictated to on *what* he should be doing as well as *how* he should be doing it, which is the meaning of the wonderful words "coordination of efforts and elimination of duplication"?

Nevertheless the position, I think, is not quite hopeless. Nobody, not even a Japanese government official, would consider it humiliating to ask his doctor's advice when he feels sick. If STAC raised its prestige to such a level that it became customary to seek its opinion, if it managed to make itself "fashionable" (as it now seems a fashion to see a psychoanalyst), I think it would be well on the road to solving the problems in its relationship to the government.


THE ANNUAL ALUMNI FUND
February 22, 1951 No. 1
The Johns Hopkins University
$115,930.00
One Hundred and Fifteen Thousand Nine Hundred Thirty Dollars 00 Cents
The Alumni Association
FOURTH ROLL CALL

ALUMNI FUND Chairman J. H. Fitzgerald Dunning (right) presents to President Detlev W. Bronk a check for $115,930, representing the gifts of Hopkins alumni during the Fourth Roll Call.

REPORT OF THE ALUMNI FUND CHAIRMAN

Owing to increased costs, the publishing of a final report, as in previous years, will be abandoned for The Fourth Roll Call. Instead, a summary of operations appears on the following pages and individual lists of contributors will be sent to all alumni for their respective classes or groups.

It is with deepest gratification that I report to you the results of The Fourth Roll Call. The total of $115,930 represents a new high as far as Roll Calls are concerned and I am confident that every department of the University will feel the impact of your interest and generosity.

Space does not allow individual comment on the fine work accomplished in each class and department. However, special attention is called to some of the outstanding results attained in the various groups.

In the Undergraduate Classes, 1886 and 1899 again attained a perfect participation of 100% with the 96.55% of 1905 following closely. Honors for the highest total of any class or group go to 1906 with their total of $5,077.50. The School of Medicine Classes of 1898, with a participation of 85.71%, and 1926, with a total of $3,750, led their classes. The alumni from the Geology Department, with a participation of 35%, and the Chemistry Department, with a total of $3,110.74, led the Graduate Department Group. The Specials Committee led the Miscellaneous Group with a total of $3,640.

New groups included in the Roll Call for the first time were as follows: Writing, Speech and Drama; Art as Applied to Medicine; The Staff of the Institute for Cooperative Research; and Parents. May I welcome them to the family of Hopkins workers and thank them for their fine efforts and results.

It has been a real pleasure for me to serve as chairman of The Fund for the past two years. I am particularly grateful to the class and department agents who have served so well and to those alumni and friends whose loyalty and generosity have made the results of the Roll Calls possible.

J. H. Fitzgerald Dunning

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			Percent of Total
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For general use by the University according to need		$ 59,921.26	51.69
2. HOMEWOOD SCHOOLS:			
a. General purposes	$ 7,238.85		6.24
b. Restricted purposes	5,021.50		4.33
		12,260.35	10.57
3. SCHOOL OF MEDICINE:			
a. General purposes	26,164.66		22.57
b. Restricted purposes	5,037.50		4.35
		31,202.16	26.92
4. SCHOOL OF HYGIENE AND PUBLIC HEALTH:			
a. General purposes	1,662.53		1.43
b. Restricted purposes	625.00		.54
		2,287.53	1.97
TOTAL		$105,671.30	
5. OTHER GIFTS FROM ALUMNI APPLICABLE TO ROLL CALL:			
a. The Joseph T. Singewald, Jr. Camp Fund	736.50		.64
b. The Louis Hamman Scholarship Fund	9,227.00		7.96
c. Miscellaneous	295.20		.25
		10,258.70	8.85
GRAND TOTAL		$115,930.00	100.00
6. RECAPITULATION			
a. For unrestricted and general purposes	95,007.30		81.95
b. For restricted purposes	20,922.70		18.05

ANALYSIS OF GIFTS

Overall Totals		
a. Donors		5,569
Alumni	5,258	
Others	311	
b. Total Amount		$115,930.00
Alumni	$113,052.50	
Others	2,877.50	
c. Alumni Participation		21.57%
d. Alumni Average Gift		$21.50
e. Alumni Known Living		24,378

ACCOUNTING OF EXPENSES

Salaries	$ 8,710.81
Printed and Processed Materials	4,165.74
Postage	2,356.79
Miscellaneous—Office Supplies, Telephone & Telegraph	607.21
TOTAL	$15,840.55

GROUP AND CLASS STATISTICS

Group	*Agent*	*Donors*	*Total*	*Participation*	*Average*
Undergraduate Classes	(Listed by classes below)	2,443	$40,027.47	26.25%	$16.38
School of Medicine Classes	(Listed by classes below)	1,562	48,572.18	50.10%	31.10
School of Higher Studies	(Listed by departments below)	1,347	12,654.06	20.73%	9.39
School of Hygiene and Public Health					
Hygiene	Dr. Gilbert F. Otto	176	2,211.53	15.52%	12.57
Public Health	Dr. Thomas D. Dublin	103	956.33	9.36%	9.28
McCoy College	Mr. William G. Ewald Miss Julia F. Hoopper Miss Mabel K. Korber Mr. Robert C. Lloyd Mr. Thomas E. Marburger	363	1,659.43	10.09%	4.57
Faculty	Dr. Elmer V. McCollum	214	3,119.50	13.86%	14.58
Art as Applied to Medicine	Mrs. Garrie R. Davis (Ranice Birch)	25	212.00	22.12%	8.48
Specials	Dr. H. A. B. Dunning	127	3,640.00	26.08%	28.66
Applied Physics Laboratory Staff	Mr. Robert B. Curry	46	562.00		12.22
Institute for Cooperative Research Staff	Dr. Arthur Ruark	3	37.00		12.33
Parents	Mr. Paul Hornick	73	1,058.00		14.49
Friends	Dr. J. H. Fitzgerald Dunning	188	1,220.50		6.49

UNDERGRADUATE SCHOOLS

Class	Agent	Donors	Total	Participation	Average
Old Guard	Dr. J. H. Fitzgerald Dunning	1	$ 5.00	33.33%	$ 5.00
1886	Dr. Alfred R. L. Dohme	4	50.00	100.00%	12.50
1887	Dr. G. L. Hendrickson	2	20.00	66.67%	10.00
1888	Dr. John White	2	35.00	50.00%	17.50
1889	Dr. Ross G. Harrison	8	265.00	100.00%	33.12
1890	Mr. Sylvan H. Lauchheimer	3	80.00	42.86%	26.67
1891	Mr. Randolph Barton, Jr.	5	97.00	55.55%	19.40
1892	Mr. Lester L. Stevens	11	492.35	64.71%	44.76
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1897	Sen. George L. Radcliffe	14	305.00	46.67%	21.75
1898	Mr. Thomas Fitzgerald	7	101.00	25.00%	14.43
1899	*Dr. Harry S. Greenbaum	8	207.50	30.77%	25.94
1900	Dr. Ronald T. Abercrombie	16	1,002.00	44.44%	62.63
1901	Mr. John M. Bandel	13	280.00	39.39%	21.54
1902	Hon. Ogle Marbury	21	1,086.00	65.65%	51.71
1903	Mr. Harry K. Tootle	14	547.50	37.84%	39.11
1904	Mr. Reginald S. Opie	12	305.00	52.17%	25.42
1905	Mr. Robertson Griswold	28	3,336.50	96.55%	119.16
1906	Dr. Henry T. Collenberg	21	5,077.50	47.72%	241.79
1907	Dr. George A. Stewart	21	275.00	52.50%	13.10
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1909–10	*Mr. Harold L. Russell	17	212.50	38.64%	12.50
1911	Mr. Edward D. Martin	15	230.00	42.86%	15.33
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1915	Mr. William A. Baker	18	897.50	40.00%	49.86
1916	Mr. Thomas J. Tingley	23	241.00	38.98%	10.48
1917	Mr. C. Gordon Pitt	31	1,577.50	30.69%	50.89
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1919	Mr. Ferdinand Meyer	36	650.50	37.89%	18.07
1920	Mr. F. Howard Townsend, Jr.	32	478.50	23.36%	14.95
1921	Mr. Kent R. Mullikin	67	1,147.50	44.97%	17.13
1922	Mr. Joseph A. Naviasky	47	900.00	22.59%	19.15
1923	Mr. J. Hudson Huffard	63	1,140.50	30.14%	18.10
1924	Mr. John H. Croker	61	1,559.50	28.37%	25.57
1925	Mr. William P. Calhoun	65	835.16	29.28%	12.85
1926	Mr. Carroll M. Berndt	72	902.00	34.78%	12.53
1927	Dr. Larkin H. Farinholt	71	868.99	33.97%	12.24
1928	Mr. David Kaufman	87	959.25	30.24%	11.03
1929	Dr. W. Grafton Hersperger	100	1,024.16	40.32%	10.24
1930	Mr. C. Corner Brownley	80	847.63	29.74%	10.59
1931	Mr. Robert B. DuVal	58	498.50	29.14%	8.59
1932	Mr. Lorne R. Guild	80	700.75	36.36%	8.76
1933	Mr. Ernest H. Hanhart	55	536.50	21.57%	9.75
1934	Mr. Church Yearley	63	485.50	21.43%	7.71
1935	Mr. Roland B. Merson	56	378.00	18.42%	6.75
1936	Mr. Wentworth D. Boynton	66	504.33	24.63%	7.64
1937	Mr. Roy L. Hartman	56	662.50	21.13%	11.83
1938	Maj. Edward W. Clautice	61	388.33	22.34%	6.37
1939	Mr. Lewin Wethered	43	280.00	17.06%	6.51
1940	Mr. Edgar G. Frey	59	385.00	20.49%	6.53
1941	Dr. Elmer Hoffman	49	332.50	15.86%	6.79
1942	Mr. Morgan H. Pritchett	37	218.00	16.16%	5.89
1943 (Feb.)	Mr. Michael G. Callas	50	251.50	23.26%	5.03
1943 (Oct.)	Mr. Floyd L. Culler, Jr.	26	180.00	27.96%	6.92
1944	Mr. Kenneth H. Grim	30	129.83	19.75%	4.33
1945	Mr. E. Horace Siegler, Jr.	8	119.50	8.60%	14.94
1946	Mr. W. Everett Smith	15	67.50	7.85%	4.50
1947	Mr. Robert H. MacGill	38	157.17	14.84%	4.14
1948	Mr. Grant Peoples	83	356.17	21.73%	4.29
1949	Mr. Louis V. Koerber	170	694.00	29.88%	4.08
1950	Mr. Quint Langstaff	93	828.85	13.75%	8.91

* Deceased.

SCHOOL OF MEDICINE

Class	Agent	Donors	Total	Participation	Average
1897	Dr. Guy L. Hunner	4	$ 163.85	57.14%	$ 40.96
1898	Dr. Joseph H. Pratt	6	109.50	85.71%	18.25
1899	Dr. John A. Luetscher	5	155.00	50.00%	31.00
1900	Dr. Herbert W. Allen	8	255.00	53.33%	31.88
1901	Dr. Edward H. Hume	9	350.00	60.00%	38.89
1902	Dr. Stephen Rushmore	9	121.00	39.13%	13.44
1903	Dr. G. Canby Robinson	13	375.00	50.00%	28.85
1904	Dr. DeWitt B. Casler	15	225.00	53.57%	15.00
1905	Dr. David Marine	15	535.00	55.56%	35.67
1906	Dr. Frank Hinman	20	745.00	45.45%	37.25
1907	Dr. Paul W. Clough	20	627.50	48.78%	31.38
1908	Dr. Roy D. McClure	15	500.00	38.46%	33.33
1909	Dr. William L. Estes, Jr.	20	1,349.50	68.97%	67.48
1910	Dr. L. Whittington Gorham	25	1,113.50	51.02%	44.54
1911	Dr. George A. Stewart	25	952.50	43.10%	38.10
1912	Dr. Alan M. Chesney	38	1,242.50	58.46%	32.70
1913	Dr. Henry W. Cave	28	1,572.50	47.46%	56.16
1914	Dr. Alan C. Woods	40	1,857.50	58.82%	46.44
1915	Dr. Benjamin Tappan	37	1,012.00	52.11%	27.35
1916	Dr. J. Mason Hundley, Jr.	21	687.00	34.43%	32.71
1917	Dr. Merrill C. Sosman	26	1,558.50	34.66%	59.94
1918	Dr. Amos R. Koontz	38	1,235.83	56.72%	32.52
1919	Dr. Edward M. Hanrahan	39	664.50	50.00%	17.04
1920	Dr. Lay Martin	37	1,945.00	45.12%	52.57
1921	Dr. Cecil H. Bagley	25	1,142.50	30.86%	45.70
1922	Dr. Charles W. Wainwright	37	1,074.00	50.68%	29.03
1923	Dr. Charles H. Peckham	46	1,235.00	55.42%	26.85
1924	Dr. T. Terry Burger	37	867.17	57.81%	23.44
1925	Dr. John V. Goode	31	1,190.00	44.93%	38.39
1926	Dr. E. P. H. Harrison, Jr.	27	3,750.00	43.55%	138.89
1927	Dr. James Bordley, III	38	1,512.50	53.52%	39.80
1928	Dr. Francis W. Gluck	37	2,085.00	58.73%	56.35
1929	Dr. Earle M. Chapman	27	787.50	44.26%	29.17
1930	Dr. James N. Brawner, Jr.	40	1,953.00	67.80%	48.83
1931	Dr. Merrell L. Stout	27	700.00	40.91%	25.93
1932	Dr. R. Carmichael Tilghman	35	878.33	53.85%	25.10
1933	Dr. C. Bernard Brack	59	1,234.67	80.82%	20.93
1934	Dr. John Whitridge, Jr.	51	1,881.17	72.86%	36.89
1935	Dr. George S. Mirick	33	929.16	50.00%	28.16
1936	Dr. Palmer H. Futcher	49	1,010.00	75.38%	20.61
1937	Dr. J. Donald Woodruff	42	1,236.83	66.67%	29.45
1938	Dr. Edward H. Richardson, Jr.	35	520.50	50.00%	14.87
1939	Dr. William E. Grose	32	882.50	45.71%	27.58
1940	Dr. R. Paul Higgins, Jr.	38	606.34	58.46%	15.96
1941	Dr. Roger L. Greif	34	625.00	50.75%	18.38
1942	Dr. Douglas Carroll	37	494.50	50.68%	13.36
1943 (Feb.)	Dr. George H. Bunch, Jr.	31	554.50	44.93%	17.89
1943 (Nov.)	Dr. Jack M. Burnett	29	293.50	39.73%	10.12
1944	Dr. Joseph D. B. King	27	403.00	42.86%	14.93
1945	Dr. Frederick G. Germuth	29	321.00	37.18%	11.07
1946	Dr. Thomas N. P. Johns	25	177.33	32.05%	7.09
1947	Dr. Arthur A. Siebens	19	372.00	24.36%	19.58
1948	Dr. John M. Thompson	26	233.00	33.77%	8.96
1949	Dr. William F. Fritz	22	107.50	31.43%	4.89
1950	Dr. Carol G. Johnson	24	162.00	35.82%	6.75

SCHOOL OF HIGHER STUDIES

Department	Agent	Donors	Total	Participation	Average
Art and Archaeology	Dr. Sarah Freeman	26	$ 160.50	18.18%	$ 6.17
Biology	Dr. Charles D. Howell	98	685.89	22.02%	7.00
Chemistry	Dr. Harry N. Holmes	218	3,110.74	23.59%	14.27
Classics	Dr. James W. Poultney	37	343.00	17.21%	9.27
Education	Mrs. Alsoph H. Corwin (Irene M. Davis)	130	694.50	18.49%	5.34
Engineering	Mr. John I. Yellott	160	590.35	22.47%	3.69
English	Dr. Calvin D. Linton	61	445.00	14.35%	7.30
Geology	Dr. John B. Reeside, Jr.	90	1,648.00	36.00%	18.31
German	Dr. Taylor Starck	24	97.00	22.22%	4.04
History	Dr. Kent Roberts Greenfield	67	739.17	18.26%	11.03
Mathematics	Dr. C. H. Wheeler, III	36	199.50	14.29%	5.54
Oriental Seminary	Dr. Frank R. Blake	49	358.50	33.33%	7.32
Philosophy	Dr. Ray H. Dotterer	20	143.50	17.09%	7.18
Physics	Dr. R. Bowling Barnes	102	963.50	23.94%	9.45
Political Economy	Dr. Robert W. Thon, Jr.	51	1,126.00	15.55%	22.08
Political Science	Dr. E. Pendleton Herring	62	522.33	24.22%	8.42
Psychology	*Dr. Vernon P. Scheidt	31	217.50	12.55%	7.02
Romance Languages	Dr. Guy E. Snavely	73	574.33	19.01%	7.87
Writing, Speech and Drama	Mr. Louis D. Rubin, Jr.	12	34.75	22.64%	2.89

* Deceased.

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